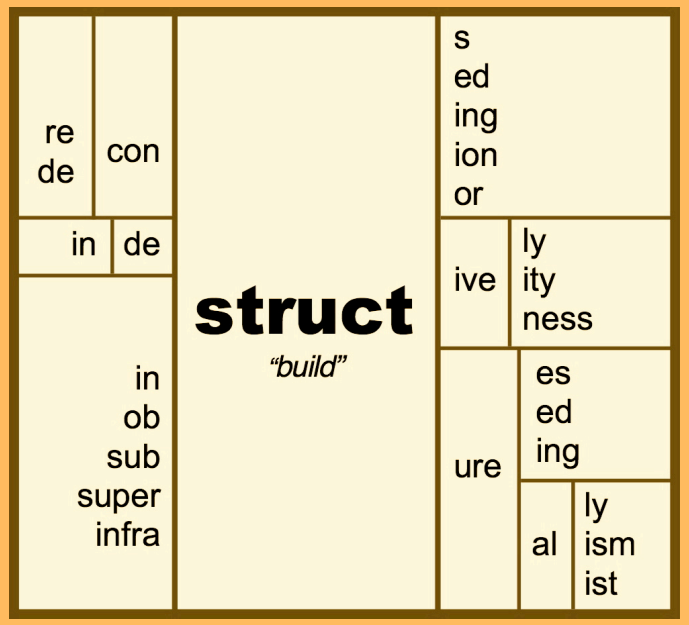
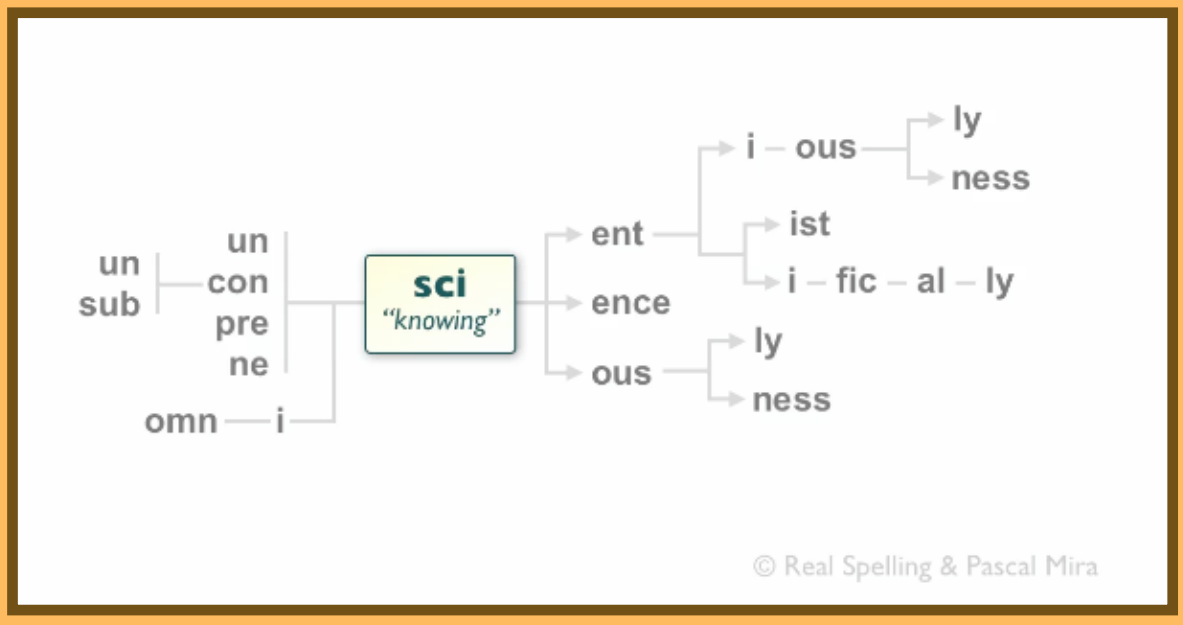
Challenge Your Assumptions: The Science of Spelling?





Structured Word Inquiry

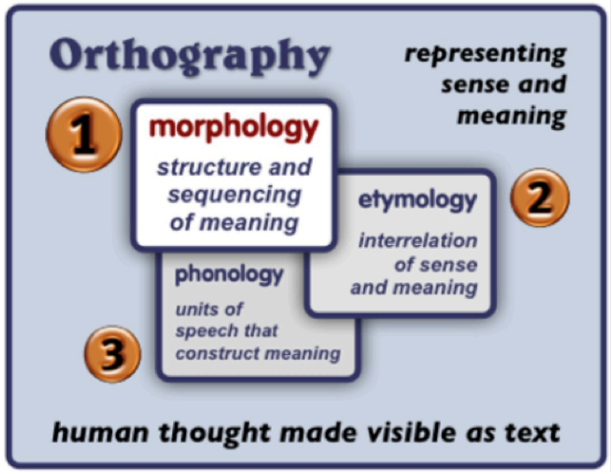
Resource Booklet

Jan 2015 Intersession, Nueva School

by Peter Bowers

Guides for Structured Word Inquiry

A model of English orthography from www.realspelling.com



Stuck on a Spelling?

Investigate with these questions...

(1) What does the word mean?

(2) How is it built?
(Can you identify any affixes with a word sum?)

(3) What other related words can you think of?
(Can the Word Searcher help you make a matrix?)
(Can a word origin dictionary help you?)

(4) What are the sounds that matter?
(What grapheme/phoneme correspondences can you find that fit in your hypothesized morphemes?)

morphological connections?

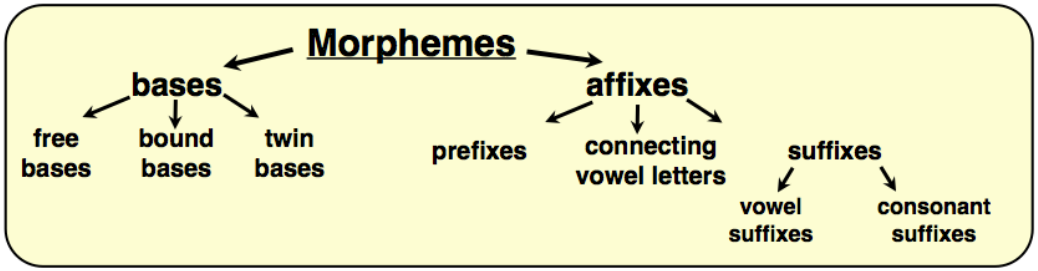
etymological connections?

Guiding Principles of Structured Word Inquiry

- ***The primary function of English spelling is to represent meaning.***
- ***The conventions by which English spelling represents meaning are so well-ordered and reliable that spelling can be investigated and understood through scientific inquiry.***

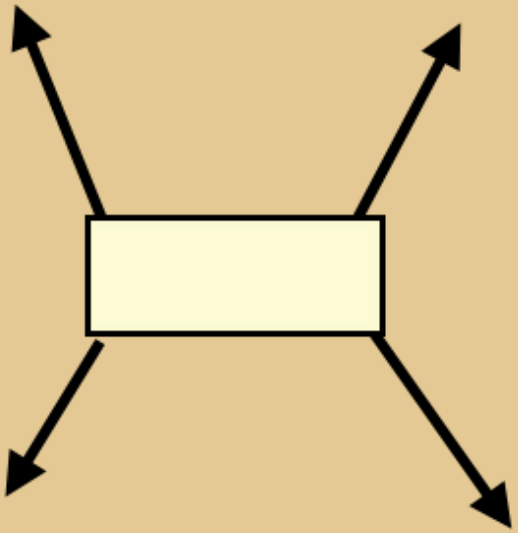
Scientific inquiry is necessary to safely guide spelling instruction and understanding.

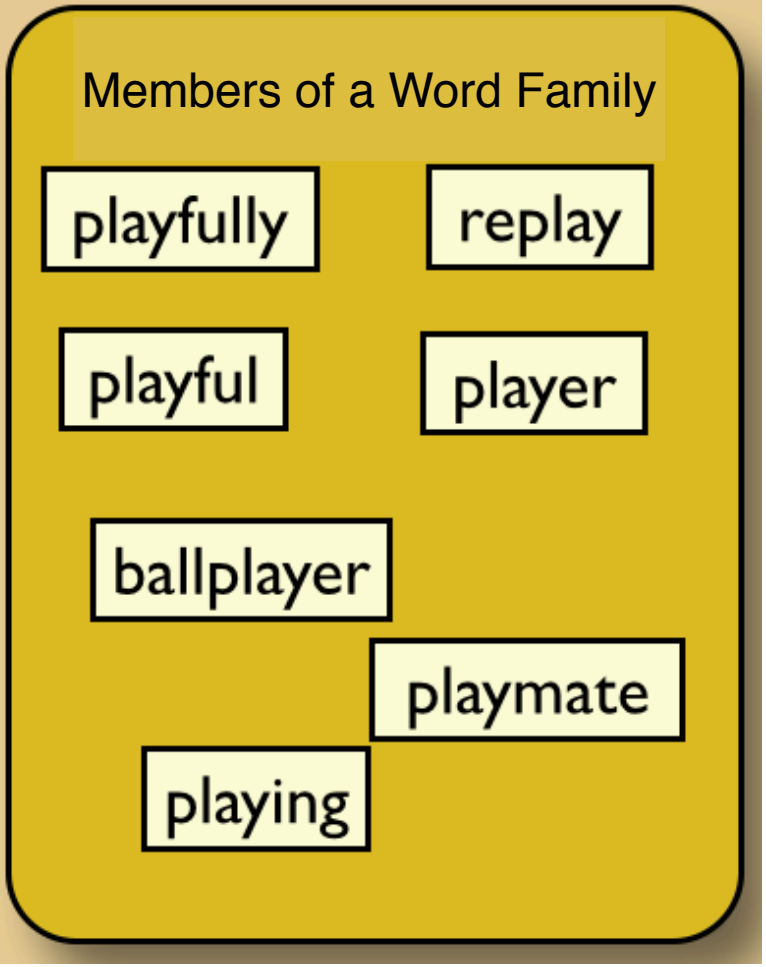
- ***Scientific inquiry is the only means by which a learning community can safely accept or reject hypotheses about how spelling works.***



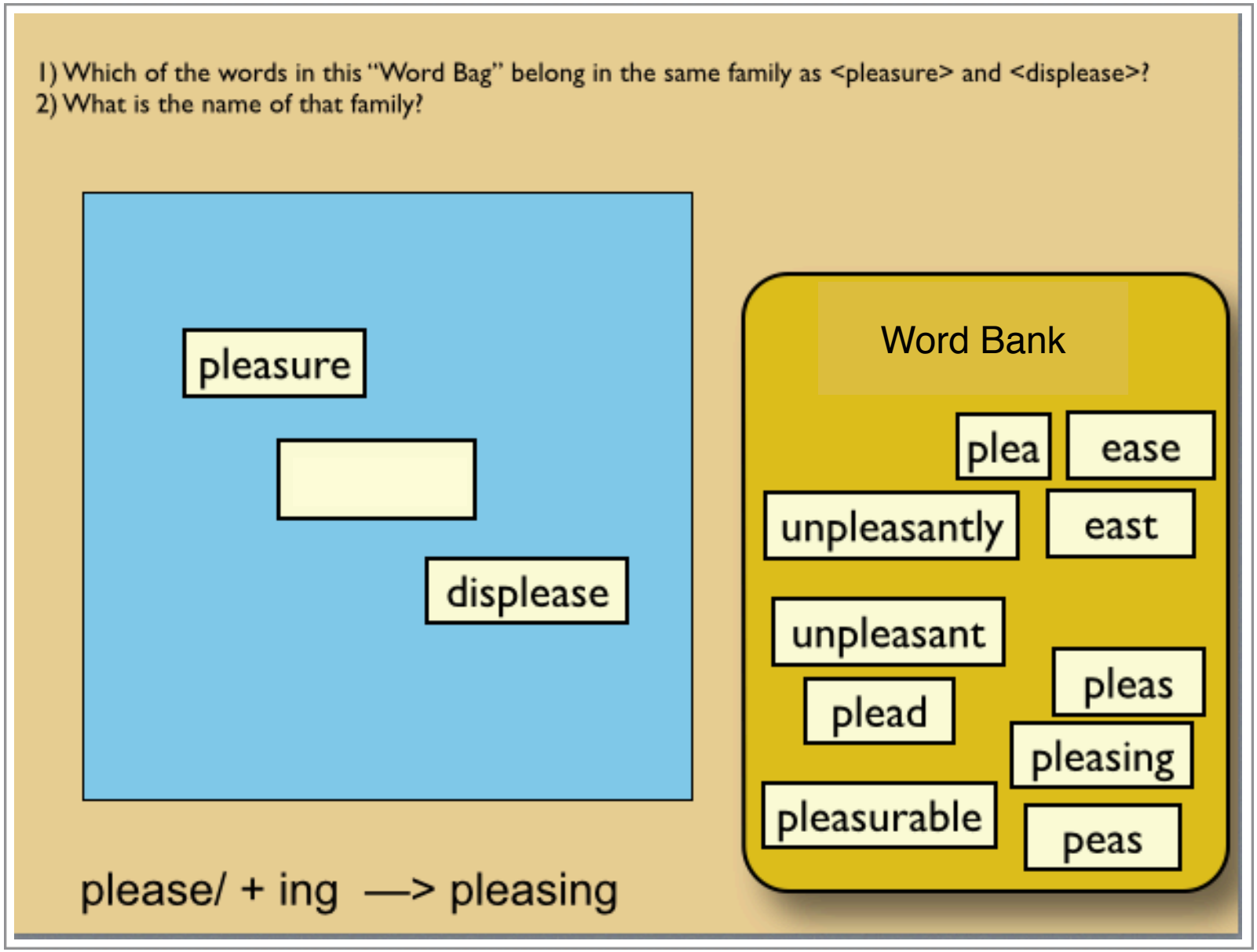
Structured Word Inquiry Activities...

1. Arrange the members of this word family on the 4 arms of this web.
2. Write what you think the name of this word family is in the centre.

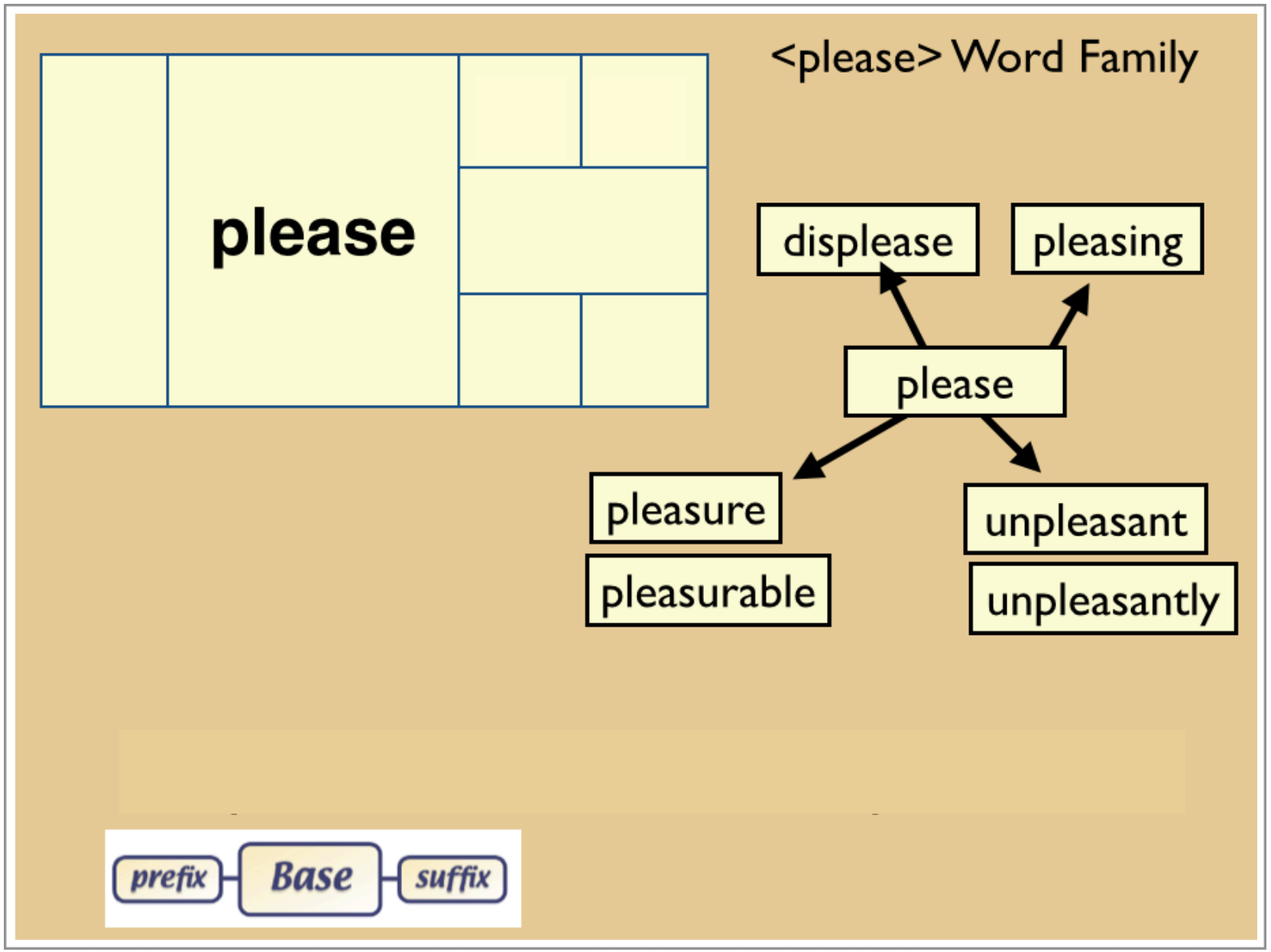




Structured Word Inquiry Activities...



Structured Word Inquiry Activities...



Investigate the structure of <knowledge>!

1. Analyze these words with word sums according to the hypothesis that they share the base <know>. (Can you prove all the affixes?)
2. Represent analyzed words in the Matrix.

known

knows

knowable

knowing

unknown

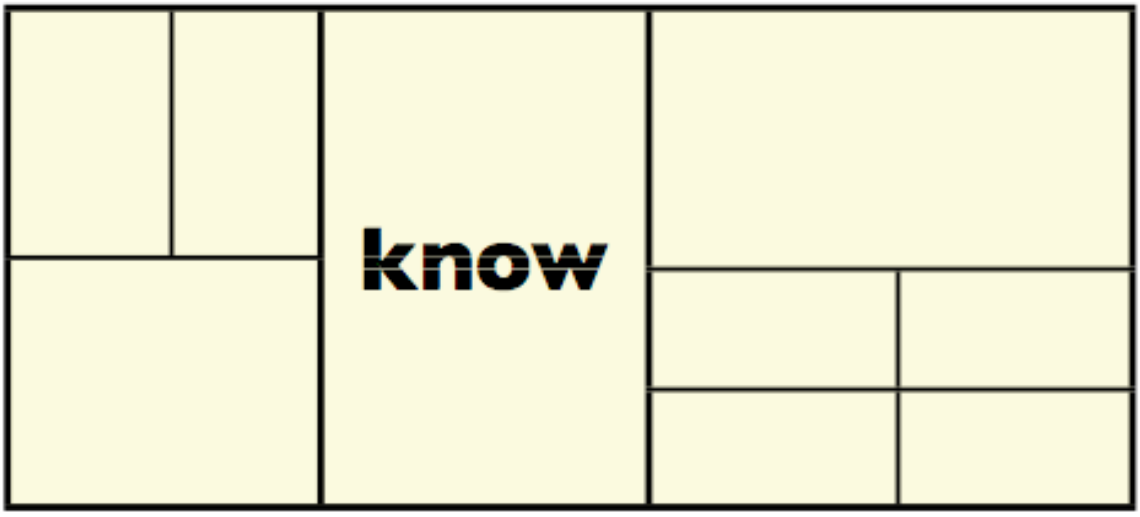
knowingly

unknowingly

knowledge

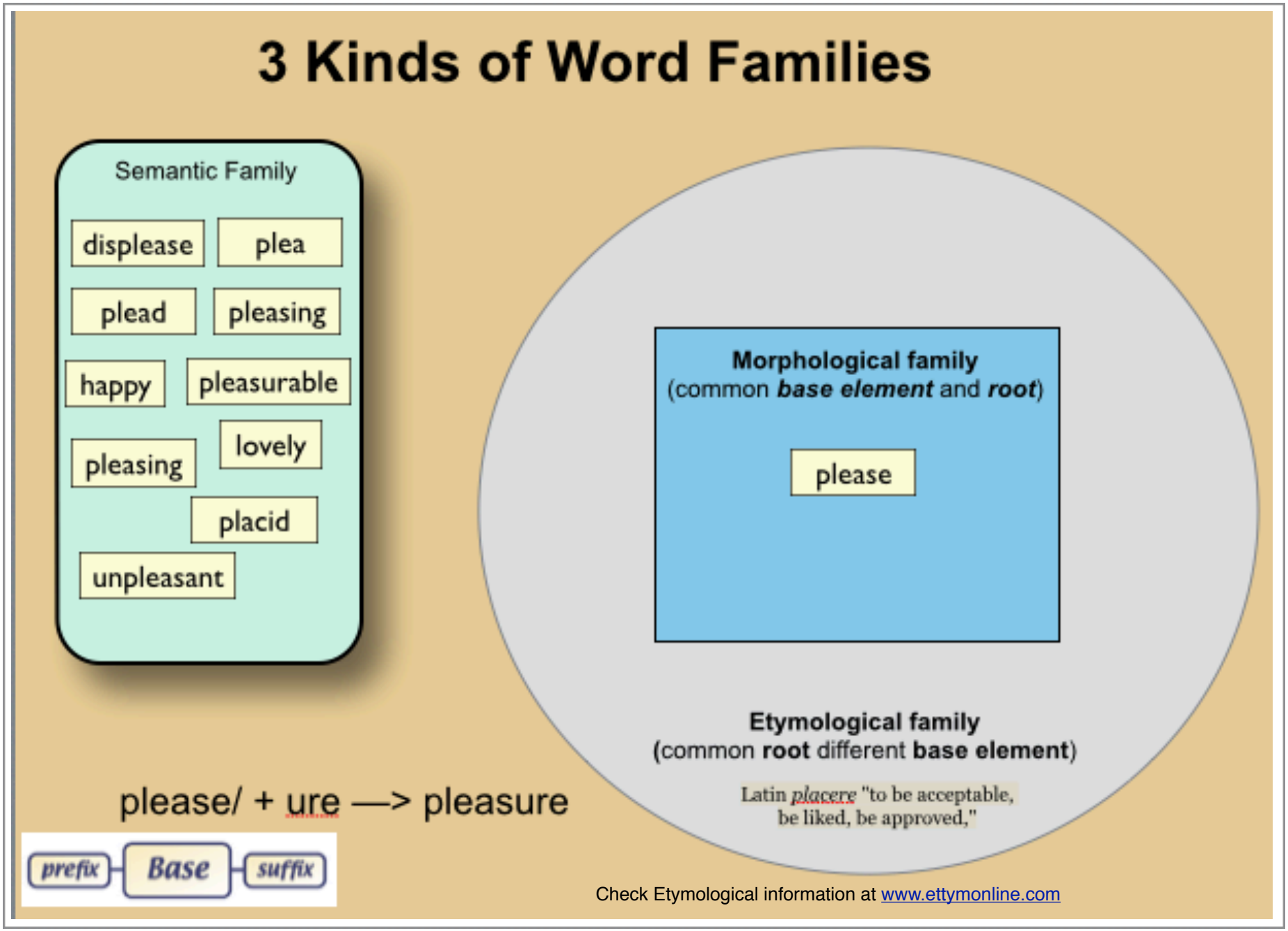
knowledgeable

unbeknownst



See on-line Mini-Matrix-Maker here.

Structured Word Inquiry Activities...



Activity: 3 Word Families & The Structure & Meaning Test

1) Semantic word families -- a general meaning connection

The words in the "Semantic Family" section of the diagram (previous page) were selected because they can be considered to share a common general sense and meaning. The "structure and meaning test" allows us to study the orthographic structure of these words to analyze and categorize the nature of that meaning connection scientifically.

2) Words in the same etymological family pass the "meaning test"

Words in the same ***etymological family*** share more than a general semantic connection. They share a common history that is marked by a common etymological ***root*** that can be researched in an etymological reference (e.g. Etymonline). The denotation of a *historical* root is echoed in the meaning of its descendants -- *current* English words. Words that share a root can be placed within the area of the circle in the diagram.

Example Investigation:

- ***<happy>*** *and* ***<pleasing>*** *have no historical connection, so they do not fit anywhere within the circle.*
- ***<pleasing>***, ***<plead>*** *and* ***<pleasurable>*** *share the Latin root 'placere' so they belong within the area of the circle. But which of these words fit within the square of the "morphological family" inside that circle?*

3) Morphological Families (structure test):

To determine if words are of the same orthographic morphological family -- and could therefore be represented in the same matrix -- we need to show that they pass *BOTH* the structure and meaning tests.

1) Meaning test: The words in question must share a root.
2) Structure test: The words in question must share a base element as demonstrated through analysis with a coherent word sum.

For a word scientist to determine that a word sum is coherent, they must be able to show a) evidence that each morpheme is used in another words, and b) that the word sum is in coherence with suffixing conventions.

Example Investigation Continued:

- ***<happy> and <pleasing>:*** *Clearly no word sum could link <happy> and <pleasing>, so they cannot be in the same morphological family.*

  The lack of any spelling connection gives no reason to hypothesize an etymological connection. By chance, however, some words seem to share a base, but turn out not to share a root (e.g., <playful> and <display>). Such words "pass the structure test" but cannot be placed on the same matrix because they do not pass the meaning test -- they share no root.

- ***<pleasing>, <plead>*** *and* ***<pleasurable>:***

  All of these words share the same Latin root 'placere' for "to be acceptable, be liked, be approved". Thus these words "pass the meaning test". They belong in the circle (same etymological family).

  Which of these words *also* pass the structure test (coherent word sum) and therefore also belong in the square for words of the same morphological family?

  please/ + ing ➔ pleasing

  please/ + ure/ + able ➔ pleasurable

  plead ➔ plead

  Additional hypothesis: Can all these words to a common base <plea>?

  Test this hypothesis with a word sum: plea + se ➔ please

  There is no evidence of an <-se> suffix, so we much reject this hypothesis.

  The words <pleasing> and <pleasurable> can be analyzed to show the same underlying base element <please>, so they are of the same morphological and etymological family.

  There is no word sum that can link <plead> to the base <please>, so <plead> is of the same etymological family of <please> but not the same morphological family. Similarly, <plea> shares the same root, but no base, so it can be included in the etymological family circle.

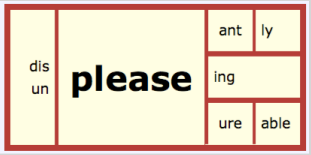
Note! We can see that *one root* can grow into *multiple bases*.

Why categorize words this way?

The process of analyzing words according to these categories forces us to inspect the history and structure of words carefully. In this way we build not only our vocabulary, but our understanding of our writing system, and thus our curiosity motivation to notice and spelling-meaning connections, and our skill for analyzing and understanding those connections.

Computer tools to make your own matrix with word sums

- Mini-Matrix-Maker (Basic Tool - Free, for both Mac & PC)
- Word Microscope (More involved tool that guides your investigation, includes banks of morphemes, saves and organizes data from investigations and more. Currently for PCs only. The video at this introductory page offers a good review of the process of the structure and meaning test.



Structured Word Inquiry Challenge:
A Spelling "Science Fair"

Conduct and present a scientific spelling investigation.

In teams pick words from the bank at right (or suggest others you'd like to investigate.

Use the "Stuck on a Spelling?" chart to investigate the structure, history and relatives of your word.

Your team will find a way to present the trail of your investigation including evidence you used to reject hypotheses. The questions you still have are as important as any conclusions you still have.

You will be expected to use word sums, matrices, etymological and other references. You can have a go at word nets if you like. If you think you may have encountered twin bases, ask for help.

Ultimately, my hope is that you will present your learning to your classmates and teachers after I am gone to help them understand what you have been learning.

Feel free to be as creative with how you take on this challenge discuss any ideas with your team, other students and Pete. We can also Zoom in expert linguists from around the world.

Note you may find guidance from pages in your booklet that we may not have studied yet!

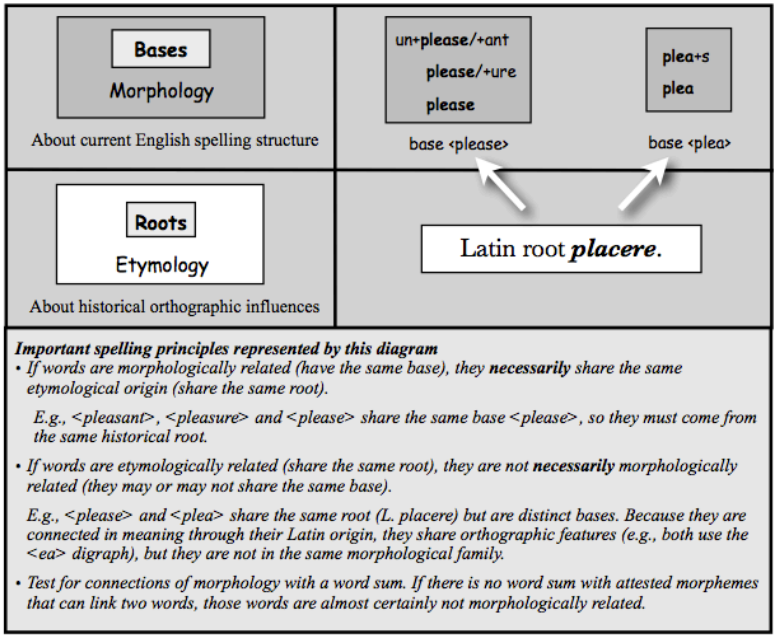
Have fun!

Starter Word Bank

hypothesis
conquering
transformation
science
evidence
evolution
revolution
logic
genetics
design
technology
subjectivity
objectivity
information
probability
evolution
conquest
discovery
invention
observation
inference
comprehension
metaphor
thesis

More Structured Word Inquiry Challenges

1) Roots growing into multiple bases


Bases
Morphology
About current English spelling structure
un+please/+ant
please/+ure
please
base <please>
plea+s
plea
base <plea>
Roots
Etymology
About historical orthographic influences
Latin root placere.
Important spelling principles represented by this diagram
• If words are morphologically related (have the same base), they necessarily share the same etymological origin (share the same root).
E.g., <pleasant>, <pleasure> and <please> share the same base <please>, so they must come from the same historical root.
• If words are etymologically related (share the same root), they are not necessarily morphologically related (they may or may not share the same base).
E.g., <please> and <plea> share the same root (L. placere) but are distinct bases. Because they are connected in meaning through their Latin origin, they share orthographic features (e.g., both use the <ea> digraph), but they are not in the same morphological family.
• Test for connections of morphology with a word sum. If there is no word sum with attested morphemes that can link two words, those words are almost certainly not morphologically related.

Review the information above from page 37 of THTWWW to guide an work on the following challenges:

a) Find the 8 members of the etymological family with the Latin root 'placere" identified by www.etymonline.com when you type that root in the search engine.

b) Use word sums to do morphological analysis those words to identify the distinct written bases that can be found in those words. The diagram above shows two (<please> and <plea>). How many more can you find?

c) Construct at least one matrix that represents at least 5 words built from one of the bases. You might want to use the Word Searcher, and/or Mini-Matrix-Maker to help you. Feel free to to the matrix by hand also.

d) Work with your group to find a way to present your research, discoveries and any questions that remain.

e) Make a similar investigation with any of the following: Latin roots: "aster", "caedere", "rumpere"

Greek roots: "hydr", "morphe", "khronos"

(Remember that just because one root can grow into multiple bases is not evidence that it must!)

2) From RS Theme 5L: An etymological project on words to do with stars

INVESTIGATION: Identifying real etymological links -2 -

Copy the following word bank on to your board.

predict	appreciate
premature	preface
depreciation	preamble
precious	precede
precaution	prepare

All these words have the letter combination < pre > in common. This looks like the very common prefix < pre->, which carries the basic meaning of "before, in front, in advance". But there are TWO distinct etymological families in this set of words.

1. Ask your students to check the meaning of all the words.
2. Next they have to identify the two families to which these words belong and to rearrange the words appropriately into two sets.

3) Use word sums to identify the common base and root for these sets of words and construct a matrix.

a) <conductor>, <abduct>, <seductive>, <reduction>

b) <science>, <unconscious>, <prescience>, <omniscient>

c) <stable>, <instant>, <contrast>, <stature>

Matrices for families with free and bound base elements

All of these matrices are taken from the 70 matrices DVD.

un dis	**ease**	y	er est ly ness
		es ing ed	

mis dis ab un re	**use**	ful less	ly ness
		es ing ed er age able ive	
		u	al ly

im ap re	**probe** *"prove, try, test"*	able ably ability ity	
		ate	ion er ary

non con in dis **extra**	**sense** *"feel, perceive"*	ible ibly ibility ion ory or	
		ate	ion al ly ism
		ite	ive ly ity
			ize *or* ise es ed ing
		u	al ly ity
			ous
		ic	al
		us	

un	**equ** *"same, even, equal"*	able ably ity acy	
		al	s ed ing ity
			ize *or* ise es ed ing er
			ate ion
		ate	es ed ing ion
			or i al
		ite	able ably
		anime	ity ous
in ad		i	**vale** ent ence
			voce al ate
			later al
			nox

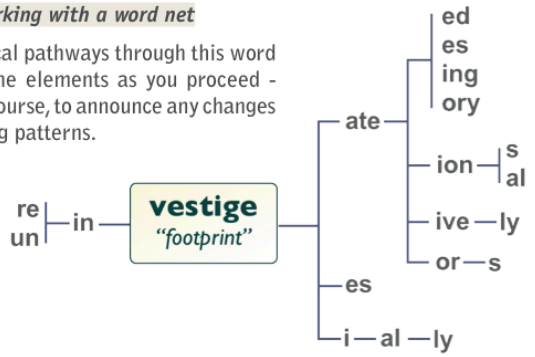
Rules for reading a word matrix:

- Read a matrix from left to right.
- Make only single, complete words from a matrix.
- Only build words you can use in a sentence.
- You don't have to take an element from every column of a matrix – BUT...
- You must not 'leapfrog' over a column.
- WATCH THE JOINS! Sometimes changes happen where you add a suffix.

ne un in ante pre peri post	o	**nate** *"come into being, be born"*	al ly ity
			ion al ly ity
		ure	al ly
			ist ic
			ize *or* ise es ed ing
			ate ion
		ive	s ity

STUDY TASK: *Working with a word net*

Trace morphological pathways through this word net, announcing the elements as you proceed - remembering, of course, to announce any changes due to the suffixing patterns.



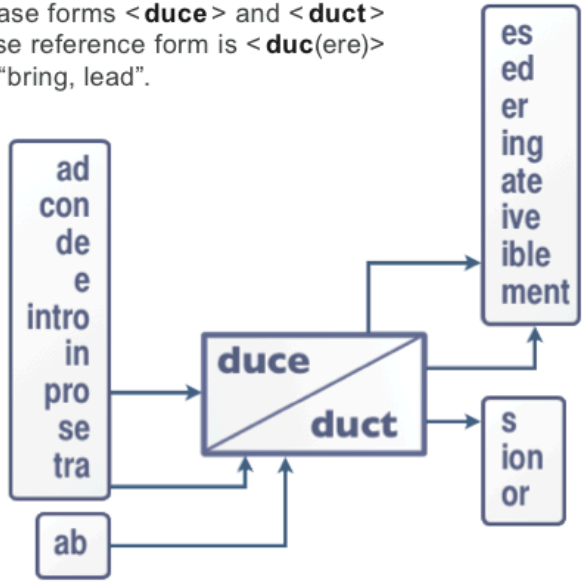
Introducing word nets and twin bases:
An introduction to examples from a not-yet-published Real Spelling theme.

The ***root*** of ***both*** of these base forms <**duce**> and <**duct**> is the single Latin verb whose reference form is <**duc**(ere)> and that has the denotation "bring, lead".

Here is a representation of this 'twin' base <**duce** / **duct** > as the centre of a net. Pathways connect both forms with affixes associated with each.

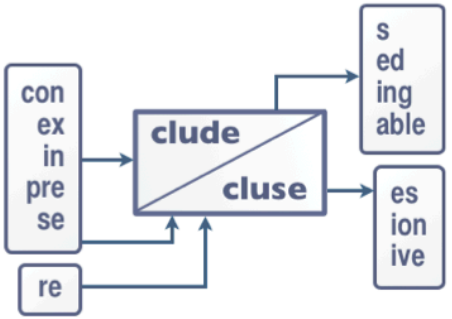
The net can be extended by including other base elements that can form compounds with these base forms.

Examples are <**viaduct**> and <**aqueduct**>.



Note that the base form <**duce**> is bound while <**duct**> is free. Click on the information button for a reminder of the terms 'free' and 'bound'.

Learning from the related pair <include> and <exclusive>



After our detailed analysis of three of the base element pairs in the originalevidence bank you should now be able to analyse the twin base element implied in the pair <**include**> and <**exclusive**> for yourself.

In this pair each of the twin forms is ***bound***.

It is clear from <**include** ➜ **in** + **clude**> that the final <**e**> is an integral part of the base element form.

How do we know from <**exclusive**> that the base element form in this word is not *<**clus**> but <<**cluse**> with the final <**e**>?

The first line of investigation in this sort of case is to assemble derivations of the base being verified in which the base itself is ***final***. Here, such a derivation exists; it is <**recluse** ➜ **re** + **cluse**>. This evidence is conclusive!

Spelling Out & Writing Out Word Structure

Do these activities with guidance of the "Constructing Word Sums Booklet" (click here). Explore this page and this page for more on spelling out word structure.

Synthetic word sums:

1. Mark suffixing changes on left.
   (See tools for suffixing conventions here and here.)
2. Spell out and write out your word structure hypothesis n the right side of the re-write arrow following the conventions in the "Constructing Word Sums Booklet".

Analytic word sums:

1. Spell out your hypothesis of the structure of the given word *without* the scaffolding of a completed word sum with a partner.
2. Test your hypothesis (or hypotheses) by writing out the substructure on the right of the word sum.

Note: To spell out the word structure in the "Analytic Word Sums", you need to identify whether the starter word is a base, or if it is complex.

Synthetic Word Sums

Substructure	→	Surface Structure
spring	→	spring
care + ful + ly	→	carefully
spell + ing	→	
cute + er	→	
cut + er	→	
act + ive + ity + es	→	
bury + ing	→	
bury + es	→	
sky + dive + ing	→	
carry + age + es	→	
un + heal + th + y + ly	→	
nate + ure + al + ly	→	

Analytic Word Sums

Surface Structure	→	Substructure
reach	→	
react	→	
always	→	
does	→	
pliers	→	
duckling	→	
spilling	→	
rightfully	→	
disruptive	→	
assistance	→	
sisterhood	→	
bookkeeper	→	

Videos of teachers and students spelling out word structure with word sums and working with matrices

- The word sum is the basic linguistic tool for analysis of morphological word structure. See Real Spelling tutorial films on this topic here.
- Visit the WordWorks YouTube page for many videos illustrating and integrating spelling-out word structure into everyday instructional practice.
- See a Skype tutoring session with a Grade 2 student using spelling out of word structure with word sums and the matrix.

The word matrix
(www.realspelling.com)

un in re con	**quest** *Latin Root* ***quaerere*** *'ask, seek, gain'*	s ing ed
	ion	s able ing

*The **word matrix** marks the only feature of an orthographic morphological family that is stable - the underlying orthographic representation of its morphemes. These representations correspond to what Carol Chomsky (1970) called "lexical spellings."*

The pronunciation and connotation of a morpheme can vary across members of a family. The lexical spelling of a morpheme -- that is captured by word sums and matrices -- remains stable.

The morphological matrix is a map of the interrelation of *structure* and *meaning* of written word families

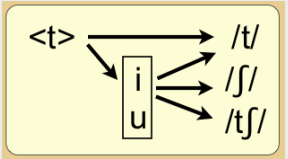
The word matrix represents members of an orthographic morphological word family. Such word families share a connection in *both* **structure** and **meaning**. (Real Selling tutorial films on morphology here.)

- *structure*: common underlying spelling of the base
- *meaning*: common ultimate etymological origin of the base

Inclusion of a word in a matrix is tested with a word sum. The word sum isolates the constituent morphemes (bases and affixes) on one side of the rewrite arrow (marking all morphological suffixing conventions) and on the other, the realized surface structure of the word.

An "echo" of the denotation of the root meaning of the base of any word represented by a matrix can be detected in the connotation of that realized word. The denotation of the root meaning of a word is checked with an etymological reference (e.g. etymonline.com).

Interrelation of graphemes and morphemes



Graphemes comprised of single letters or 2- or 3-letter teams that represent a phoneme. They occur within morphemes.

Possible phonological representations of a grapheme are signaled by circumstances.

The diagram above shows three of the possible phonological representations of the <t> grapheme. Two of these are realized in the words of the <quest> matrix shown on this page.

Note that since the <o> and the <e> graphemes in <does> are not in the same morpheme, there is no <oe> digraph in this word.

base spelled	base pronounced	Word Sums (examples listed by pronunciation of base)
<quest>	/kwɛstʃ/	*quest* + *ion* → question *quest* + *ion* + *able* → questionable
	/kwɛst/	in + quest → inquest con + quest → conquest re + quest + ed → requested

matrix	base spelled	base pronounced	Word Sums (examples listed by pronunciation of base)
do ing es ne	<do>	/du:/	do + ing → doing
		/dʌ/	do + es → does do + ne → done

Links & Resources

Wordworks: www.wordworkskingston.com

Free resources, images, video clips and descriptions of this instruction in action around the world.

Real Spelling www.realspelling.com

This is not a spelling program or teaching approach. It a reference that explains how English spelling works. Find many free resources and also excellent resources for sale.

LEX: Linguist-Educator-Exchange (Get LEX grapheme cards here)

This excellent blog by Gina Cooke for educators who trying to make sense of the linguistic structure of words.

On-line Structured Word Inquiry Tools:

The Word Searcher:

A key free tool for collecting words according to surface patterns so that word scientists can investigate the substructure of words. This is an invaluable tool for your spelling investigations.

Mini Matrix Maker

A basic tool for typing word sums and turning them into matrices. See a "how to video" at this link.

The Word Microscope:

This software allows the user to construct matrices from word sums, search for likely members of morphological families and much more. It guides learners in their quest to make sense of English spelling.

See a short user's manual and "how to video" here.

Latdict:

Click here for a Latin-English Dictionary useful for identifying ***twin bases.***

Real Spellers: www.realspellers.org

This website by Matt Berman (Grade 4 teacher at Nueva School in Hillsborough, California) is an excellent site for resources and spelling discussions from teachers around the world.

Teacher Blogs with Videos, Investigations etc:

- Dan Allen's Grade 5 Blog
- Ann Whiting's Grade 7 Blog
- Skot Caldwell's Grade 4/5 Blog
- Mary Beth Steven's Grade 5 Blog